Journal of Endodontics, 1996, Vol. 22

OCTOBER

Col. Schindler, Chairman Of Endodontics
59th MDW Dental Directorate
Lackland AFB, TX

Articles:

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OCTOBER (CONT.)

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Articles:

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Wound Healing after Mucoperiosteal Surgery in the Cat

Selvig KA, Torabinejad M. Wound Healing after Mucoperiosteal Surgery in the Cat. J Endodon 1996;22:507-15.

Purpose: To examine reattachment of mucoperiosteal tissues to the cervical root surfaces and the denuded root surfaces of the alveolar process in the cat.

M&M: 8 cats were each given 4 full-thickness triangular flaps. After being left open for 30 minutes, the flaps were closed, sutured, and compressed. Epithelial healing, organization of the blood clot, connective tissue healing and hard tissue resorption and repair were evaluated histologically.

Results: The wound space contained a blood clot, & distinct lining of fibrin at 1 day. At 3 days, the wound was bridged by 2 - 3 cell layers of epithelium. There was a distinct cellular infiltrate in the coagulum and the wound margins. At 1 week, epithelialization was complete. There was superficial resorption lacunae crestally and on the vestibular cortex. At 2 & 4 weeks, the gingival connective tissue and junctional epithelial healing was essentially complete.

C&C: The authors state that prior to 4 days is too early to remove sutures because the tensile strength of the wound is related to the collagen content. This content shows a rapid increase after 4 days. Reattachment of the flap is considerably slower than healing of the gingival soft tissue, and the slowest repair is in the alveolar mucosal region.

Oct. 1996 **Robin E. Hinrichs**

Interpretation of chemically created periapical lesions using direct digital imaging

Meier AW, Brown CE, Miles DA, Analoui M. Interpretation of chemically created periapical lesions using direct digital imaging. J Endodon 1996;22:516-20.

PURPOSE: To evaluate whether digital radiographic images modified by pseudocolor enhancement, contrast reversal, or histogram equalization are more diagnostic than conventional images.

M&M: Fifteen teeth (4 maxillary and 11 mandibular) were extracted from human cadaver jaw specimens without evidence of root or bone fracture. Periapical lesions were created in the extraction sockets by placing a cotton pellet saturated with 70% perchloric acid at the apex of the socket. Before each RVG exposure (using the Trophy USA direct digital radiographic system), the cotton pellets and any demineralized bone was removed, and the extracted teeth were repositioned in the sockets. To ensure consistent x-ray angulation, a plexiglass positioning device was used. After each exposure, the teeth were removed and fresh acid was applied. This sequence was repeated at time intervals of 2, 4, 8, 12, 16, and 24 h.. A total of 105 radiographic exposures were made in the linear setting on the RVG system and transferred to a computer network server for storage and future retrieval. The images were altered by contrast reversal, pseudocolor enhancement, and two forms of histogram equalization. The 525 total images were randomized for display on a computer monitor for evaluation by 5 endodontists. Images were evaluated twice by each rater, with viewings ranging 3 to 8 days apart. Statistical analysis determined interrater variability, intrarater reproducibility, and the relative merits of each enhancement technique.

RESULTS: At hour 0, or immediately before acid application, the linear and reverse-contrast image scores were significantly lower than global histogram equalization. At hours 2 and 4, no image type had significantly different scores from the others. At hour 8, both global and regional histogram equalizations had significantly higher scores than reverse contrast. At hours 12, 16, and 24, pseudocolor-enhanced and linear image scores, as well as global and regional histogram-equalized images scores, were all significantly higher than reverse contrast image scores. Intrarater reproducibility showed moderate agreement, but analysis showed only a fair level of interrater agreement.

C&C: Even with enhanced imaging methods, this study shows that radiographic interpretation by evaluators and between evaluators is not a stable and consistent process. Under the conditions of this study, the reverse-contrast setting was not helpful in visualizing periapical lesions. No comparison was made between these enhanced imaging methods and conventional radiography.

October 1996 **Orest M. Harkacz, Sr.**

Canal Debridement: Effectiveness of Sodium Hypochlorite and Calcium Hydroxide as Medicaments

Yang S, Rivera EM, Walton RE, Baumgardner KR. Canal Debridement: Effectiveness of Sodium Hypochlorite and Calcium Hydroxide as Medicaments. J Endodon 1996;22:521-5.

Purpose: To evaluate the ability of these two agents to enhance canal debridement by sealing them into the canal space after routine preparation, for 1 or 7 days.

M&M: 81 mandibular molar mesial roots with curvatures less than 33 degrees were prepared with a step-back flaring technique and K-Flex files. Apical preparation was to a size 25. Canals were dried, and CaOH mixed as a thick paste with distilled water, or 2.5% NaOCl was placed in the canals and sealed with Cavit. After 1 or 7 days, canals were opened, irrigated and dried, then sectioned into thirds and canal and isthmus cleanliness was evaluated.

Results: There were no significant differences between CaOH or NaOCl and unmedicated control groups at either time interval. Isthmi and fins were poorly debrided in all groups.

C&C: Both of these material require direct contact with tissue for their dissolution properties to be effective. Additionally, NaOCl has limited long-term ability to dissolve tissue as it must be continually be replenished. CaOH mixed as a thick paste may never have even reached the desired contact of tissue.

October 1996 **Robin E. Hinrichs**

Transient effects of low-energy CO_2 laser irradiation on dentinal impedance: implication for treatment of hypersensitive teeth

Fayad MI, Carter JM, Liebow C. Transient effects of low-energy CO_2 laser irradiation on dentinal impedance: implication for treatment of hypersensitive teeth. J Endodon 1996;22:526-33.

PURPOSE: To determine if laser irradiation caused permanent or transient alterations in dentinal permeability, as measured by changes in electrical impedance.

M&M: Dentin wafers were mounted as a window in an electrolytic cell in preparation for electoconductivity measurements (measuring the resulting electrical impedance). Impedance measurements were performed by varying the potential of a single, constant frequency. The wafers were equilibrated in 0.1 M of KCl. The wafer specimens were irradiated with a CO_2 laser (12 W, 0.1 ms, energy density 1.25 J/cm^2). The time for impedance equilibration after irradiation was compared with equilibration after mounting.

RESULTS: Mounted samples required 48 h to approach equilibrium in the electrolyte. After laser irradiation, impedance of previously equilibrated samples also required 48 h to equilibrate. This, along with exponential curve fitting, confirmed that laser treatment reintroduced a transient alteration in impedance. Equilibration time after irradiation and the mounting were similar. Dentin desiccation apparently caused this transient impedance. Energy dispersive X-ray analysis confirmed the disappearance of K^+Cl^- after irradiation. Therefore, laser irradiation may cause dentinal desiccation, yielding temporary clinical relief of dentinal hypersensitivity until rehydration occurs.

C&C: Lasers have been claimed to treat hypersensitive teeth by sealing the dentinal tubules after laser irradiation, thus increasing dentinal resistance to dentinal fluid movement. It is also believed that protein coagulation via the laser could transiently reduce dentin permeability without surface alteration. The findings of this study indicate that temporary relief of dentinal hypersensitivity occurs as a result of dentinal desiccation, which would recur after rehydration. Tubule sealing was not observed in this study.

October 1996 **Orest M. Harkacz, Sr.**

In Vitro Evaluation of the Cytotoxicity of Pure Eugenol

Gerosa R, Borin M Menegazzi G, Puttini M, Cavalleri G. In Vitro Evaluation of the Cytotoxicity of Pure Eugenol. J Endodon 1996;22:532-4.

Purpose: To asses the cytotoxicity of pure eugenol and to determine the maximum nontoxic concentration using ethanol as a solvent at nontoxic concentrations.

M&M: Human gingival fibroblasts were cultured and exposed to cells medium containing 20 µl (0.34 M) alcohol diluted with eugenol at concentrations of between 0.015 to .947 μ_M. Quantified cell survival was established.

Results: 0.34 M alcohol alone gave a 100% survival rate of cells, and was used as a control. Cell survival was maintained at concentrations of 1.9 µM free eugenol. This indicates that toxicity began at concentrations > 1.9μ_M eugenol and ethanol

October 1996 **Robin E. Hinrichs**

Bacterial leakage in endodontics: an improved method for quantification

Michailesco PM, Valcarcel J, Grieve AR, Levallois B, Lerner D. Bacterial leakage in endodontics: an improved method for quantification. J Endodon 1996;22:535-9.

PURPOSE: To develope an accurate procedure for assessing the leakage of root fillings using bacteria. The method selected used fluorimetry and scanning electron microscopy to detect the presence of a fluorescent bacteria.

M&M: Seventy-five extracted single-rooted teeth were instrumented with step-back filing to an apical size 30. Patency was maintained and 4.5% NaOCl irrigation was utilized. The teeth were divided into 5 groups of 15 teeth each and obturated as follows: group 1 - zinc oxide-eugenol paste inserted with a lentulo and a single gutta-percha point without any condensation; group 2 - obturated as in group 1, but with paraformaldehyde containing material (phenoplast) as the sealing paste; group 3 - the cement was introduced into the root canals using a K-file two sizes smaller than the master apical file with a counterclockwise motion and the canal was obturated using gutta-percha with a lateral condensation technique; group 4 - zinc oxide-eugenol paste with gutta-percha thermomechanically compacted using the McSpadden compactor; group 5 - zinc oxide-eugenol paste with vertically condensed warm gutta-percha (the Schilder technque). All access cavities were sealed with Cavit. The teeth were sterilized in ethylene oxide, transferred to broth medium containing *Pseudomonas fluorescens* ATCC 13525, and incubated for periods of 15 days, 1 month, 2 months, 3 months, and 6 months. At the end of the incubation period, the crowns of the teeth were removed and the roots longitudinally sectioned, then analysed using fluorimetry and scanning electron microscopy to detect the presence of the fluorescent bacteria.

RESULTS: The procedures involving compaction of the gutta-percha gave a more effective seal than the use of a paste sealer with uncondensed gutta-percha. There was no statistically significant difference between the leakage results from the lateral, vertical, and thermomechanical condensed techniques.

C&C: Even though the procedures involving compaction of gutta-percha gave a more effective seal, these results are somewhat misleading. Leakage continued to increase over the 180 day period for all obturation techniques without ever achieving a plateau. Therefore, even though some techniques had a better seal than others, the indication was that none of the seals were effective in preventing leakage. Also of interest is that the paraformaldehyde-containing material seemed to have no more inhibitory effects on the growth of the microorganism than zinc oxide-eugenol.

October 1996 **Orest M. Harkacz, Sr.**

Lateral Condensation of Small, Curved Root Canals: Comparison of Two Types of Accessory Cones

VanGheluwe J, Wilcox LR. Lateral Condensation of Small, Curved Root Canals: Comparison of Two Types of Accessory Cones. J Endodon 1996;22:540-2.

Purpose: To evaluate the influence of two sizes of accessory cones on the quality of obturation of small, curved root canals obturated with lateral condensation and a MF finger spreader.

M&M: 30 small roots with curvature ranging from 10 - 62 degrees were instrumented with a step-back technique. Canal taper was adequate when a MF finger spreader could be placed within 1 mm of prepared WL. Half were obturated using MF conventional accessory cones, and half with #25 standardized accessory cones. One week post fill, the teeth were sectioned and the percentage of GP within the canal was measured.

Results: There were no statistically significant differences between groups at the 2 or 4 mm level. The MF cones were much easier to place compared to the #25 standardized ones, possible due to the greater taper of the MF cones.

C&C: Although in the photo of the #25 cone, MF finger spreader and MF cone the apical size of each looks quite different, the author states that close examination with magnification through a stereomicroscope showed no apparent differences in size. The greater taper of the MF cones gave a stiffer coronal portion to aid in handling.

October 1996 **Robin E. Hinrichs**

Enhanced surface hardness by boron implantation in nitinol alloy

Lee DH, Park B, Saxena A, Serene T. Enhanced surface hardness by boron implantation in nitinol alloy. J Endodon 1996;22:543-6.

PURPOSE: To produce harder and more wear resistant cutting edges in Nitinol alloys, without affecting their superelastic bulk-mechanical characteristics.

M&M: A high concentration of boron was incorporated into NiTi alloys by ion implantation as a nonequilibrium process. With an implantation dose of 4.8×10^{17} boron/cm^2, a concentration of boron (30 atm%) was incorporated into NiTi alloy by 110 keV boron ions at root temperature (25^0C). Hardness testing of ion-implanted thin films from flat substrates was performed with a low-load nanoindentation test.

RESULTS: Boron-implanted and unimplanted (pure) Nitinol alloys showed surface hardness of 7.6 ± 0.2 and 3.2 ± 0.2 GPa, respectively, at the nanoindentation depth of 0.05 μm. The ion-beam-modified NiTi alloy exceeds the surface hardness of stainless steel.

C&C: This study shows that the hardness of NiTi alloy can be enhanced by high-dose boron implantation. Formation of hard precipitates, like TiB_2 or nickel boride embedded in the NiTi matrix, is most likely responsible for the mechanical property enhancement. Preliminary experiments on the flexibility of Nitinol instruments before and after ion-beam modification showed no apparent difference, as expected, because the thin-film coating is only ~0.2 μm on the file.

October 1996 **Orest M. Harkacz, Sr.**

Chloroform Uptake by Gutta-Percha and Assessment of Its Concentration in Air during the Chloroform-Dip Technique

Margelos J, Verdelis K, Eliades G. Chloroform Uptake by Gutta-Percha and Assessment of Its Concentration in Air during the Chloroform-Dip Technique. J Endodon 1996;22:547-50.

Purpose: To asses the amount of chloroform that gutta-percha receives during the chloroform-dip technique and to provide an evaluation of the chloroform vapors in the operatory air.

M&M: 90 #35 GP cones were dipped in either pure chloroform, or a commercial preparation containing 5% colophonium in chloroform. Cones were dipped for 1,2, or 3 s, then weighed after 30 seconds. Vials containing the chloroform were then dehydrated and the amount of zinc was measured to estimate the amount of loss of GP. Open vials or Petri dishes of each solution were placed in operatories and a gas detection system measured the chloroform in the air after three minutes.

Results: No differences were observed between the two types of solutions. As the time of dip increased, there was a significant increase in the uptake of chloroform in each group. Negligible quantities of Zn were found in the dehydrated vials after each cone was dipped, indicating the increase in weight was due to chloroform uptake. Less than 2 ppm chloroform from the vials, and ~8 ppm from the Petri dishes were measured in the air.

C&C: The colophonium preparation has been introduced to enhance the GP adhesion to the root canal walls, but no explanation of how this is to be accomplished is mentioned. The amounts of chloroform in the air are well below the 50 ppm level imposed by OSHA for any 10-min period.

October 1996 **Robin E. Hinrichs**

A clinical study of direct pulp capping applied to carious-exposed pulps

Matsuo T, Nakanishi T, Shimizu H, Ebisu S. A clinical study of direct pulp capping applied to carious-exposed pulps. J Endodon 1996;22:551-6.

PURPOSE: To evaluate the success rates of direct pulp capping applied to pulps that had been exposed at the end of the removal of carious dentin, and to analyze the relationship between the success rates and their clinical findings. The authors also examined the length of time necessary for adequate postoperative follow-up.

M&M: Forty-four teeth from 38 patients were selected for the study. All of the teeth showed no intense pain and were treated by direct pulp capping caused by carious exposure of the pulp. Progress of these teeth was followed-up for at least 3 months since application of the direct pulp capping agent. The mean age of the patients was 41.9 years, ranging from 20 to 69. Teeth that showed vital signs and no signs or symptoms of irreversible pulpitis at least 3 months after pulp-capping were designated successful.

RESULTS: The success rate in this study was 81.8%. Age of the patients, type of teeth, responses to thermal stimuli and percussion, and the diameter of pulpal exposure had no bearing on the success rate. However, the degree of bleeding on pulpal exposure was related to the success rate. The success rates of cases in which postoperative follow-up periods were 3 to 18 months were similar (80 to 83%), whereas those with follow-up for 21 months (91.7%) and 24 months (100%) showed higher success rates. Although not significant statistically, patients under 40 had a higher success rate (85.7%) than those of 40 and over (75%). Also, the success rate of the patients who showed no reaction to percussion (84.2%) was higher than that of the patients who showed sensitive (50%) or mild (66.7%) reactions to percussion, but there was no significant difference. The success rate of the group with pulpal exposure of >1 mm and ≤2 mm (77.8%) was lower that those of the 0.5 mm and under group or between the 0.5 and 1 mm group (84.2% and 86.7%, respectively).

C&C: Of interest is the way the pulp exposure sites were handled. The exposure was irrigated with 10% NaOCl and 3% H_2O_2 several times, and dried with a cotton pellet, without any apparent detrimental effects. Success rates for patients without percussion (82.4%) vs. patients sensitive to percussion (50%) may not be statistically significant, but I feel may be clinically significant, as the latter condition indicates inflammation which has spread to the periapical tissues.

October 1996 **Orest M. Harkacz, Sr.**

Incidence of Pulp Necrosis Subsequent to Pulp Canal Obliteration from Trauma of Permanent Incisors

Robertson A, Andreasen FM, Bergenholtz G, Andreasen JO, Noren JG. Incidence of Pulp Necrosis Subsequent to Pulp Canal Obliteration from Trauma of Permanent Incisors. J Endodon 1996;22:557-60.

Purpose: To provide a basis for a rational treatment strategy that involves prophylactic endodontic treatment of teeth displaying pulp canal obliteration (PCO) subsequent to trauma.

M&M: 82 concussed, luxated extruded, laterally luxated and intruded permanent incisors presenting with PCO were followed for 7 - 22 years, mean 16 yr. Additional information recorded included additional traumatic episodes, orthodontic treatment, treated and untreated caries, and crown or veneer restorations. PCO was designated as partial or total. Pulpal necrosis was based primarily on the presence of an obvious apical radiolucency.

Results: The overall frequency of pulpal necrosis (PN) was 8.5%. 69% exhibited yellow crown discoloration. 51% reacted normally to EPT, 22% responded in a high-normal range, and 27% showed no response to EPT.

C&C: The 27% showing no response to EPT may or may not be vital. It is possible that they pulps may be necrotic, but have not had any bacterial contamination. Based on a life-table analysis method, the authors state that during the initial observation period of 5 yr, none of the teeth presented with a radiographic bone lesion. After an interval from 15 - 20 yrs, apical lesions had appeared, reducing the pulp survival rate to 84%. This still does not justify the routine use of RCT on teeth exhibiting PCO.

October 1996 **Robin E. Hinrichs**

Complex odontoma as periapical and interradicular radiopacity in a primary molar

Piattelli A, Perfetti G, Carraro A. Complex odontoma as periapical and interradicular radiopacity in a primary molar. J Endodon 1996;22:561-3.

SUMMARY: A complex odontoma is a malformation in which all dental tissues are represented; with individual tissues being mainly well represented, but occurring in a more or less disordered pattern. The lesion is in the majoriy of cases associated with the permanent teeth; rarely is it reported in association with the primary dentition. Compound and complex odontomas are usually located pericoronal to an impacted tooth, but they may also be found between tooth roots. The complex odontoma is less commonly located in an interradicular position. A case was presented of a 25 year old patient with pain in the left lower quadrant. The periapical radiograph showed the presence of a nonhomogeneous radiopacity, lined by a radiolucent space, located at the periapex and interradicular space of the left lower second primary molar. Extraction of the tooth and removal of the radiopaque lesion was accomplished. Histology disclosed the lesion to be a complex odontoma.

October 1996 **Orest M. Harkacz, Sr.**

Patient Records and Referral Correspondence: A Time-Saving Method

Selden HS. Patient Records and Referral Correspondence: A Time-Saving Method. J Endodon 1996;22: 564-5.

Purpose: To offer a time-saving method to deal with non-routine chart entries and related correspondence.

Summary: When treating or evaluating a patient referred by another practitioner, the author suggests dictating the chart entry and sending it to the referring dentist instead of a personal letter summarizing the evaluation and treatment. Thus, niceties and grammar may be ignored without fear of seeming ignorant.

C&C: Maintaining a good rapport with your referring dentist is always prudent.

October 1996 **Robin E. Hinrichs**